B' cncl'd.

20. (NEW) A method for providing improved shaft alignment and bearing life according to claim 18, said electromagnetic induction rotary device comprising a partial rotation torque motor for use in a galvanometer scanner.

REMARKS:

The Office rejected claims 5-7 under 35 USC 103(a) as unpatentable over Plesko's '442 in view of Stangeland's '146; alleging that Plesko teaches the claimed invention, but does not show the shaft and bearing support structure having the same coefficient of thermal expansion (CTE) as the bearing assembly set of all ceramic inner race, outer race, and bearing balls; and that Stangeland discloses shaft and bearing support with the same CTE as ceramic bearing assemblies with all ceramic components with the purpose of improving bearing longevity and wear resistance.

Applicant responds as follows. The claims rejections in the Office correspondence are 35 USC 103 obviousness rejections, for which Office policy is to follow the Graham v. John Deere Co. four factual inquiries for determining obviousness; (A) determining the scope and contents of the prior art; (B) ascertaining the differences between the prior art and the claims in issue; (C) resolving the level of ordinary skill in the pertinent art; and (D) evaluating evidence of secondary considerations. Of course, the references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; Hodosh v. Block Drug Co. Inc. 786 F.2d 1136 (Fed. Cir. 1986).

Claims 5 6 are specifically limited to (a) a partial rotation torque motor with a rotable shaft, which has (b) *all ceramic components* of a ball bearing assembly, and (c) in which *the shaft and the bearing support structures have the same CTE as the bearing components*. This combination of features is the essence of the invention. Claim 7 further limits the device to having the shaft and bearing support be a nickel-iron alloy. The advantages of the claimed structure for an electromagnetic induction rotary device, and in particular a partial rotation device, were fully discussed in the specification.

The Office alleges Plesko to "substantially teach the claimed invention except that it does not show that the shaft and the bearing support structure having the same coefficient of thermal expansion as the ceramic bearing assemblies [and] ... does not disclose ... ceramic bearing assemblies comprising a ceramic inner race, ceramic bearing balls, and a ceramic outer race."

Applicant respectfully asserts that Plesko does not *teach* bearings; he only, just barely, invokes the term in contradistinction to the main purpose of his invention. What Plesko does teach is a spring mounted shaft, a device with no bearings at all, expressly providing for X and Y translations of the shaft or core in addition to rotation. Most of the several Plesko embodiments provide, as described at column 5, lines 1-3, for a shaft or core flexibly suspended within a coil by resilient means such as flat springs, flexible elastic members, or membranes, permitting tilting of the shaft as well as rotation, where the use of bearings is irrelevant. This theme dominates the disclosure. In only one alternative embodiment where a constraint of X and Y axis motion are mentioned as within the scope of the invention, is the term "bearings" introduced. In this embodiment, best depicted by Figs. 13 and 15, and explained at column 8, lines 28 - 35 and 46-48, bearings are given short shrift as provided merely to "prevent motion" in the X and Y directions.

Plesko cannot in any way be characterized as a teaching with respect to the intricacies and sophistication of extremely high tolerance bearings and related variables in the devices discussed in this Applicant's disclosure. Plesko is essentially irrelevant in that it is nothing more in this context than an unusual example of a limited rotation device having a tiltable shaft and *no bearings*, which provides not more than a casual, passing, limited reference to the possibility of using bearings in a limited case. For these reasons, Applicant respectfully requests Plesko be withdrawn.

The Stangeland '146 disclosure of *bearing races* for bearing assemblies is directed to rotating machinery operating dry or in the presence of cryogenic propellants. It is not directed to precision, partial rotation torque motors. It discloses a gradated metal to metal-ceramic finish on

the raceway of a bearing assembly for cryogenic pumps, where the raceway is basically a steel structure thermally compatible with the shaft and housing materials, with a ceramic coating. However, there is no appreciation expressed or suggested as to the special characteristics of galvanometer-type partial rotation torque motors, including their small size, low inertia, high speed, precision alignment, and longevity requirements at issue in this applicant's disclosure, and no suggestion that using *all ceramic* components for *all components* of the bearing assembly, rather than metal components, would solve the further problems discussed by this Applicant.

Furthermore, while there is no particular aspect of this disclosure that would suggest using it alone, it is simply illogical to assert that anyone would attempt to combine it with a "bearing-less" Plesko device, to meet the goals of this Applicant's invention. While the Stangeland invention resides as a feature within a component of a bearing assembly, the difference in function between Stangeland's particular feature of a bearing raceway and the Applicant's partial rotation torque motor with all ceramic bearing components and matched CTE shaft and bearing support is entitled to great weight; In re Ellis, 476 F.2d 1370 (CCPA 1973). Indeed, as any skilled practitioner will readily attest, galvanometer scanner motors today are a very specialized subset of rotary devices in general, and *cannot* be construed as "common everyday mechanisms", the problems of which may be susceptible of improvements coming from a "broad spectrum of prior art"; Stevenson v. International Trade Comm., 612 F.2d 546 (CCPA 1979).

The above comments support the Applicant's position that Plesko is irrelevant in its absence of any indicia of the claimed invention, and in particular as it teaches a device without bearings as preferable over a device using bearing, and should therefore be withdrawn; that nothing in Stangeland would motivate one to combine it with Plesko or vice versa; and that neither Plesko nor Stangeland nor a combination of the two obviates the claimed invention under the Graham rule. It is not whether the individual differences or elements themselves would have been obvious, but whether the claimed invention *as a whole* would have been obvious in the combination; Stratoflex, Inc.v. Aeroquip Corp. 713 F.2d 782, Fed. Cir. 1983). Based on these remarks, Applicant respectfully requests the rejection be withdrawn and claims 5 – 7 be allowed.

The Office rejected claims 8-11 under 35 USC 103(a) as unpatentable over Plesko in view of Stangeland as applied above, in further view of Braunagel's '241; alleging that Braunagel discloses a shaft electrically isolated from the bearing support.

Applicant invokes its prior remarks with respect to 35 USC 103, and to the art of Plesko and Stangeland as applied to the claims. Applicant reiterates that galvanometer scanner motors today are a very specialized subset of rotating devices, and *cannot* be construed as "common everyday mechanisms", the problems of which may be susceptible of improvements coming from a "broad spectrum of prior art"; Stevenson.

Reviewing the present claims, claim 8 is dependent on claim 5, previously described, expressly adding the further limitation of electrical isolation between the shaft and the bearing support. Applicant acknowledges Braunagel's recitation of the same feature, but it is used here as a dependent limitation, and should therefore be allowable with respect to an allowable base claim.

Claim 9 is substantially a repetition of the elements of claims 5 – 8, containing at least all the recited structural limitations thereof. If any combination of claims 5 8 is allowable, claim 9 should also be allowable.

Claims 10 and 11 are substantially a repetition of the elements of claim 9, with the further structural limitation of a *reversibly* rotable shaft *restricted to less than one turn*. If claim 9 is allowable, claims 10 and 11 should also be allowable. Claim set 10 and 11 should be independently allowable as well.

Traversing this second rejection directly, Plesko and Stangeland were discussed above. The rejection extended to the 1965 Braunagel disclosure, the focus of which is a general purpose bearing assembly of mixed components, some ceramic and some metal. There is an inner ceramic race maintained under compression with spaced apart metal rings or bands, and an outer ceramic

race maintained under compression by a metal jacket. The spaces between the metal rings is occupied by ceramic roller bearings. The compressive effect of the metal rings and jacket components on the ceramic races is apparently intended to reinforce and control expansion sufficiently to maintain an acceptable level of bearing precision, while offering the other benefits of ceramic bearing contact surfaces.

As noted above, it discloses providing electrical isolation of the inner race from the outer race, effectively offering isolation of the shaft from the stator or bearing supports. However, as in the Stangeland case, the Braunagel bearings are directed to a broad range of applications in all manner of rotating machinery in all manner of environments, in distinction to the very specialized subset of partial rotation torque motors which is the focus of this invention. There is no consideration in the Braunagel bearing disclosure of the interrelated opportunities or effects of the design, size, material, weight, strength, or in particular, the thermal characteristics of the rotor, stator or bearing support structure in which the bearing might be applied.

The Braunagel bearing itself is inherently bulky and heavy relative to the application at issue. The preferred embodiment is illustrated as a roller bearing, unsuitable for the Applicant's case on its face and likely to discourage using it alone or in combination to solve the issues present in this Applicant's disclosure. For example, Applicant's inner race was particularly cited in its disclosure as being preferably very light for inertial reasons, contrary to the metal rings of Braunagel. It would be immediately apparent to one skilled in the art, even with Plesko and Stangeland in hand, that the Braunagel bearing is incompatible with a Plesko type device.

Nor is it apparent that Stangeland offers any sort of logical bridge between the no-bearing Plesko device and Stangeland raceways to make the alleged combination. It is not whether the individual differences themselves would have been obvious, but whether the claimed invention *as a whole* would have been obvious in the combination; Stratoflex. For these reasons, Applicant respectfully requests withdrawal of the rejection of claims 8 11 and reconsideration of the claim set as previously submitted.

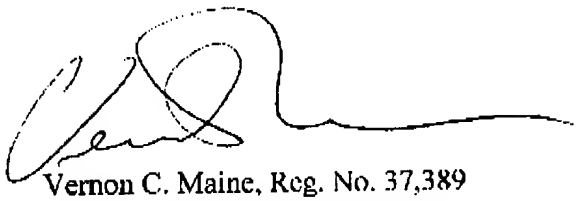
The Office cites as pertinent and Applicant acknowledges the additional art of Rokkaku and Harris. Rokkaku is an all ceramic bearing assembly without a specific application. Harris is not pertinent to the application.

Priority Claim (Box #14 of Office Action Summary)

Applicant wishes the Office to acknowledge the claim of priority under 35 USC Section 119(e). The present application claims priority to Provisional Patent Application Serial No. 60/175,623 filed on 01/11/2000.

Applicant has herein added and requests consideration of new claims 12 - 20, claiming substantially the same subject matter as the pending claims, and to which the same arguments apply with respect to the cited art. Applicant believes the above remarks to be responsive to the Office correspondence, and respectfully requests reconsideration of the claims. No new matter is added. Please contact the undersigned if there are any questions or opportunities to advance the case.

Respectfully submitted,



Vernon C. Maine, Reg. No. 37,389
Scott J. Asmus, Reg. No. 42,269
Attorneys for Applicant

Customer No. 24222
Maine & Asmus
PO Box 3445
Nashua, NH 03061-3445
tel 603-886-6100, fax 603-886-4796, email MaineandAsmus@aol.com